

ANDROSCOGGIN RIVER BASIN
SABATTUS, MAINE

SLEEPER DAM ME-00014

PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

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SABATTUS, MAINE

SLEEPER DAM
ME-00014

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NATIONAL DAM INSPECTION PROGRAM

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PHASE I INSPECTION REPORT

ME-00014

SLEEPER DAM

SABATTUS
ANDROSCOGGIN COUNTY, MAINE

SABATTUS POND OUTLET

March 27, 1979 (Field Inspection)

BRIEF ASSESSMENT

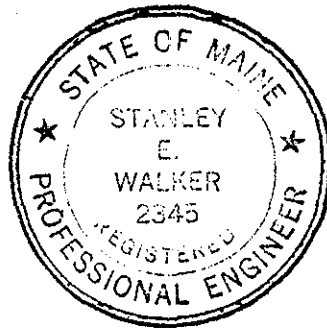
The Sleeper Dam is a dry-laid stone masonry and concrete structure with a free overfall spillway and a gated outlet. The dam is about 140 feet long and 10.5 feet high.

Based on the visual inspection and reports of past operational performance, the Sleeper Dam is assessed to be in fair condition. Major concerns regarding the safety of the dam include: loose and displaced stone masonry, inoperable gateworks, and spalled concrete.

Based on the dam's intermediate size and significant hazard potential, the spillway test flood is one-half the probable maximum flood (1/2 PMF). The spillway capacity is approximately 90 cfs or about 3 percent of the routed test flood outflow of 3,300 cfs. During the test flood, water would overtop the easterly abutment by 4 feet and the westerly abutment by 3 feet.

The recommendations and remedial measures, as outlined in Section 7, should be implemented within 12 months after receipt of this report by the owner to enhance the integrity of the structure. The following should be evaluated by a Registered Professional Engineer: 1) the hydrology of the watershed and hydraulics of the dam with respect to the need for additional spillway and outlet capacity; 2) a provision for re-establishing the integrity of the stone masonry; and 3) the need and appropriate construction details for a facility to provide access to the outlet gates during high flow. Remedial measures include: 1) repair of spalled concrete surfaces; 2) repair of outlet gates and operating equipment; 3) clearing of trees and brush from the left spillway; 4) providing around-the-clock surveillance during periods of anticipated high runoff; 5) development of a formal warning system and implementation of its use in the event of an emergency; and 6) institution of

a program of annual technical inspections.



EDWARD C. JORDAN CO., INC.

A handwritten signature in dark ink, appearing to read "Stanley E. Walker", written over a horizontal line.

Stanley E. Walker, P.E.
Project Officer

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonable possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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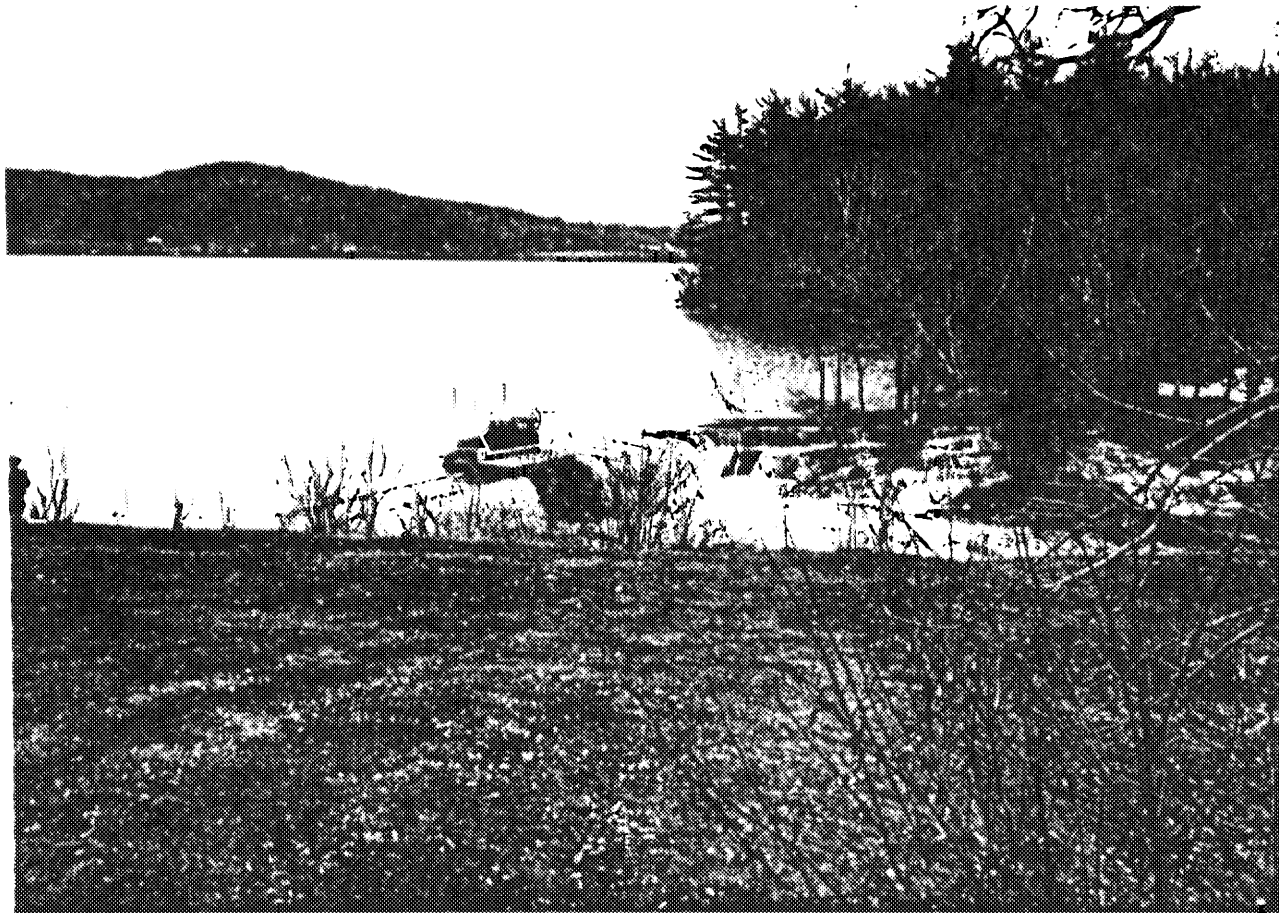
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OVERVIEW

Sleeper Dam

PHASE I INSPECTION REPORT

SLEEPER DAM

SECTION 1

PROJECT INFORMATION

1.1 GENERAL

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Edward C. Jordan Co. Inc. has been retained by the New England Division to inspect and report on selected dams in the states of Maine and New Hampshire. Authorization and notice to proceed were issued to Edward C. Jordan Co., Inc. under a letter of December 1, 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW33-79-C-0017 has been assigned by the Corps of Engineers for this work.

b. Purpose.

- (1) To perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
- (2) To encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.
- (3) To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF PROJECT

a. Location. The Sleeper Dam is located on the Sabattus River at the outlet of Sabattus Pond in the town of Sabattus, Maine. N 44° 07.3' W 70° 06.5'.

- b. Description of Dam and Appurtenances. The Sleeper Dam is a dry-laid stone masonry and concrete structure with a free overfall spillway and a gated outlet. The dam is about 140 feet long and 10.5 feet high.
- c. Size Classification. The Sleeper Dam has a storage capacity of about 4,200 acre-feet and a height of about 10.5 feet. According to the Corps of Engineers' "Recommended Guidelines for Safety Inspection of Dams," a dam with storage capacity greater than 1000 acre-feet but less than 50,000 acre-feet or height greater than 40 feet and less than 100 feet is classified as an intermediate sized dam.
- d. Hazard Classification. The Sleeper Dam is classified as having a significant hazard potential. Failure would most likely occur through either of the two spillway sections. The flow from failure would likely cause damage at the Webster Rubber Co. factory located below the first downstream bridge and at 3 to 4 residences located between the first and third downstream bridges. Flooding depths at the residences and factory would be minimal, probably not more than 1 to 2 feet.
- e. Ownership. Sleeper Dam is currently owned by 4 parties with each owning the following number of shares.

<u>Shareholder</u>	<u>No. of Shares</u>
Town of Sabattus Town Hall Sabattus, ME Tel. (207)375-4331	1-1/2
Albert Stevens Box 31 Sabattus, ME Tel. (207)375-6632	1/2
Gerry Bilodeau 712 Washington St. Auburn, ME Tel. (207) 784-1931	1

Max Miller Corporation 5
Box 97
Lisbon Falls, ME
Tel. (207)353-4371

Previous Shareholders

R.M. Hill	1/2
Date: unknown to 1956	
Deena Woolen	1
Date: unknown	
Webster Rubber Corp.	1-1/2
Date: unknown to 1978	
Farnsworth	2
Date: unknown	
Bonafide	3
Date: Unknown	

- f. Operator. Sabattus Pond Association through permission of shareholders.

Contact: Emery Boulette
Sabattus, Maine
Tel. (207)375-6543

- g. Purpose of Dam. The dam is presently being used to control the water level at Sabattus Pond for recreational purposes.
- h. Design and Construction History. Very little original design and construction data pertinent to this dam was available. According to information on file at the Webster Rubber Co., the following repairs to the dam were made in 1961: installation of new flashboards; installation of new gates, hardware and riser posts; repair and resetting of gate lifting equipment.
- i. Normal Operating Procedure. The following is an excerpt from the State of Maine Department of Environmental Protection, Finding of Fact and Order, as a result of an October 16, 1978 public hearing. This Order sets the maximum and minimum water levels and flow at Sabattus Pond and Sleeper Dam.

- "1. The owner will maintain a water level at Sabattus Pond from on or about June 1 through September 15, not to exceed a maximum of 2" above the lower spillway (eastern side). Once that level is reached, the owner should not exceed the maximum level. Throughout the summer months, the only lowering of the water below the top of the spillway should be due to natural causes or to maintain the suggested 2.5 cfs flow in the Sabattus River.
2. After September 15, the dam owner will draw down the lake by opening the gates to provide for the flushing of nutrient material. The gates will remain open until May 1 of the following year at which time the dam owner may regulate the flow not to exceed the maximum level established by the Commission.
3. In September of 1979, the Executive Director will make himself available to attend a meeting called by interested parties and the dam owner to discuss the past summer season at Sabattus Lake. At this meeting, the parties will attempt to resolve any problems resultant from the Commission's Order. If deemed necessary, possible amendment to the Commission Order will be discussed."

However, since the gates are inoperable, the level in Sabattus Pond is now controlled by flow over the spillways. There are 1 foot long iron rods cast into the crest of the easterly spillway which would allow the installation of flashboards. However, flashboards are not used.

1.3 PERTINENT DATA

- a. Drainage Areas. The drainage area above Sleeper Dam is approximately 34 square miles. The terrain is generally flat and forested with some development, primarily cottages, on the shore of Sabattus Pond.
- b. Discharge at Damsite. The following pertinent discharges were estimated assuming the water surface elevation to be at the top of the dam (elevation 244.0).

- (1) Spillway capacity - 90 cfs

- (2) Outlet gate capacity - (inoperable): capacity if operable 400 cfs
- (3) Maximum historical flood discharge is unknown, but during the March 1936 flood, the peak discharge of Sabattus River at Sabattus was determined to be 1880 cfs.
- (4) Total project discharge at test flood (1/2 PMF) - 3,300 cfs.

c. Elevation. The survey datum was adjusted to mean sea level (MSL) datum based on the assumption that the easterly spillway crest is approximately equal to normal water surface elevation of 243 (MSL) as shown on the Lewiston, Maine U.S. Geological Survey quadrangle. The following elevations above MSL are approximate only.

<u>ITEM</u>	<u>APPROXIMATE ELEVATION (FEET ABOVE MSL)</u>
Streambed at centerline of dam	234.5
Maximum tailwater	Unknown
Recreation pool	243.0
Full flood control pool	N/A
Spillway crest - easterly spillway	242.9
- westerly spillway	243.7
Top of dam easterly abutment	244.0
- westerly abutment	245.0
Test flood (1/2 PMF) pool	248.0

d. Reservoir Reach.

<u>ITEM</u>	<u>LENGTH (MILES)</u>
Spillway crest	3.9
Top of dam	3.9

e. Reservoir Storage Capacity.

ITEM	ACRE-FEET
Spillway crest	3600
Top of dam (elev. 244)	4200
1/2 PMF pool	14,600

f. Reservoir Surface Area.

ITEM	ACRES
Spillway crest	2050
Top of dam (elev. 244)	2100
1/2 PMF pool	2350

g. Dam.

Type - The dam consists of a dry-laid stone masonry and concrete structure.

Length - Approximately 140 feet including east and west abutments.

Height - Maximum 10.5 feet from top of west abutment to channel bed.

Top Width - Varies; see plan and cross-section drawings in Appendix B.

Zoning - See plan and cross-section drawings in Appendix B.

Impervious Core - None.

Cutoff - Concrete upstream face keyed into streambed or onto bedrock.

Grout Curtain - None.

h. Diversion and Regulating Tunnel. Not applicable.

i. Spillway.

Type - Broad crested, uncontrolled weir

Length - easterly: 22.0 feet
 westerly: 45.5 feet

Crest Elevation - easterly: 242.9
 westerly: 243.7

Gates - None.

Upstream Channel - The upstream channel is formed by Sabattus Pond. The spillway approaches are clear and unobstructed.

Downstream Channel - The channel immediately downstream of the dam is comprised primarily of ledge and cobbles. There are some boulders about 2 feet in diameter downstream of the dam, especially on the easterly side. The banks of the river have a moderate growth of trees and brush.

j. Regulating Outlets.

(1) Invert - 234.5

(2) Size - two gates - 3 feet wide by 5 feet high

(3) Description - Vertical lift timber gates located between the two spillways.

(4) Control Mechanism - The gates are controlled by manually operated mechanical lift equipment. Both gate stems are broken off below the lift equipment, making the gates inoperable.

SECTION 2
ENGINEERING DATA

2.1 DESIGN

No design data were available for the Sleeper Dam.

2.2 CONSTRUCTION

No engineering data were available regarding construction of the Sleeper Dam.

2.3 OPERATION

No engineering operational data were available.

2.4 EVALUATION

- a. Availability. There are no engineering data or plans available that would be useful in evaluating the integrity of Sleeper Dam.

SECTION 3
VISUAL INSPECTION

3.1 FINDINGS

a. General. The Sleeper Dam, at the outlet of Sabattus Pond, is located in a broad valley section. It is a stone masonry and concrete structure with free overfall spillways and a gated outlet.

b. Dam.

(1) Structural - The dam is constructed of dry-laid stone masonry with a concrete upstream face and spillway cap. See Appendices A, B and C for detail inspection notes, sketches and photographs. The inspection of the dam resulted in the following major findings:

- (a) The masonry in the downstream face appears loose in many areas. Voids exist in some areas where the stones have tumbled from the face (see Photo #11).
- (b) The overall dam structure appears true to line and grade. No lateral deflection or settlement is apparent.
- (c) The concrete surfaces on the structure are generally in good condition. The lower portion of the outlet sluiceway and the inlet structures are spalled quite deeply (see Photos #6, 7, & 8).
- (d) The area east of the dam is a bedrock ridge which abuts the east end of the dam. Low areas in the bedrock surface have been filled with mortar laid stone masonry. Flow was occurring over this area at the time of inspection. No erosion was evident and the area does not appear to be susceptible to erosion. Several trees and low brush were growing in this area (see Photo #3).
- (e) The embankment west of the right abutment has a turf cover and appears to be in good condi-

tion, however, this area is susceptible to erosion if overtopped.

- (2) Hydraulics - At the time of the visual inspection, the pond level was estimated to be at elevation 244.2, approximately 0.2 feet above the easterly abutment. There was about 1.3 feet of water flowing over the westerly spillway, and 2.1 feet over the easterly spillway. There was some leakage around the two timber gates.

c. Appurtenant Structures. Some leakage was occurring around the control outlet gates. The hoisting equipment appeared to be in fair condition but the lifting stems on the gates have been broken, rendering the gates inoperable.

d. Reservoir Area. The reservoir consists of Sabattus Pond, which has a surface area of about 2,050 acres. There are many cottages and some permanent residences on the reservoir shoreline.

e. Downstream Channel. The channel immediately downstream of the dam is comprised of bedrock and cobbles. There are also some boulders about 2 feet in diameter downstream of the dam, especially on the easterly side. The banks of the river have a moderate growth of trees and brush (see Photo #2). About 700 feet downstream of the dam is a breached dam and a bridge crossing. About 1,500 feet downstream of the dam the river makes a 180° bend.

3.2 EVALUATION

Based on the visual inspection, the dam appears to be in fair condition. The stone masonry which supports the spillway crest is loose and some voids exist. Further loss of masonry would result in a loss of support of the spillway crest. The control outlet structure is in fair condition but the gates are inoperable. As outlined in Section 7, rehabilitative construction and maintenance are necessary to enhance the long-term integrity of the structure.

SECTION 4
OPERATING PROCEDURES

4.1 PROCEDURES

The following is an excerpt from the Department of Environmental Protection, Finding of Fact and Order, as a result of an October 16, 1978 public hearing. This Order sets the maximum and minimum water levels and flow at Sabattus Pond and Sleeper Dam.

- "1. The owner will maintain a water level at Sabattus Pond from on or about June 1 through September 15, not to exceed a maximum of 2" above the lower spillway (eastern side). Once that level is reached, the owner should not manipulate the dam except to assure that the water does not exceed the maximum level. Throughout the summer months, the only lowering of the water below the top of the spillway should be due to natural causes or to maintain the suggested 2.5 cfs flow in the Sabattus River.
2. After September 15, the dam owner will draw down the lake by opening the gates to provide for the flushing of nutrient material. The gates will remain open until May 1 of the following year at which time the dam owner may regulate the flow not to exceed the maximum level established by the Commission.
3. In September of 1978, the Executive Director will make himself available to attend a meeting called by interested parties and the dam owner to discuss the past summer season at Sabattus Lake. At this meeting, the parties will attempt to resolve any problems resultant from the Commission's Order. If deemed necessary, possible amendment to the Commission Order will be discussed."

However, since the gates are inoperable, the level in Sabattus Pond is now controlled by flow over the spillways. There are 1 foot long iron rods cast into the crest of the easterly spillway which would allow the installation of flashboards. However, flashboards are not used.

4.2 MAINTENANCE OF DAM

The dam is in need of maintenance. According to information on file at the Webster Rubber Co., substantial maintenance was performed in 1961. This maintenance included: installation of new flashboards, installation of new gates, hardware, and riser posts, and repair and resetting of gate lifting equipment.

4.3 MAINTENANCE OF OPERATING FACILITIES

The outlet gates hoisting mechanisms appears to be in fair condition, however, the lifting stems have been broken and the gates are inoperable.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

No warning system is known to be in effect.

4.5 EVALUATION

The Sleeper Dam outlet control facilities are inoperable and in need of repair. Maintenance is unscheduled and inadequate. Due to the lack of access to the outlet gates, operation of the gates, even if repaired, would be impossible during high flow conditions. No formal warning system for either high water or structural distress is in effect at the dam.

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

- a. General. The Sleeper Dam is a dry-laid stone masonry and concrete structure with an uncontrolled free over-fall spillway and two 3x5-foot timber control gates which are presently inoperable.
- b. Design Data. Hydraulic and hydrologic design data were not available.
- c. Experience Data. No information regarding past overtopping of Sleeper Dam was available. However, during the March 1936 flood of record, the peak discharge of the Sabattus River at Sabattus, about 0.5 miles downstream of the dam was measured by the USGS to be 1880 cfs. This flow would have produced a stage in Sabattus Pond of about elevation 247 or 2 feet above the westerly abutment.
- d. Visual Observations. Flow from Sabattus Pond is discharged by an uncontrolled spillway. There are two timber gates which are inoperable due to broken lift stems. At the time of the visual inspection, the pond level was estimated to be at elevation 244.2, approximately 0.2 feet above the easterly abutment.
- e. Test Flood Analysis. The Sleeper Dam is classified as having a significant hazard potential. Based on the Corps of Engineers' "Recommended Guidelines for Safety Inspection of Dams," a test flood equal to one-half the probable maximum flood (1/2 PMF), developed in Appendix D, was used in evaluating the spillway capacity of the dam. The 33.7 square mile drainage area is characterized as flat. Using Corps of Engineers' "Preliminary Guidance for Estimating Maximum Probable Discharges," the test flood produces a peak inflow of 9300 cfs. Due to the effect of surcharge storage in the reservoir, the routed test flood peak outflow at the dam is approximately 3300 cfs. Stop logs were not in use during the visual inspection, and they are not currently used as standard operating procedure. The spillways are capable of discharging about 90 cfs or about 3% of the test flood without overtopping the easterly abutment. During the

test flood event, water would overtop the easterly abutment by 4 feet and the westerly abutment by 3 feet. Due to the nature of soil and limited cover, the earth bank west of the right abutment would not be highly resistant to erosion during periods of overtopping.

- f. Dam Failure Analysis. To determine the hazard classification for the Sleeper Dam, the potential impact of failure of the dam when the reservoir water surface elevation is level with the top of the dam was analyzed. The failure analysis relied upon the Corps of Engineers "rule of thumb" guidelines. The hazard potential was determined by calculating downstream dam failure hydrographs which might result from a breach of the left spillway. The left spillway section was selected because it appears to be the most vulnerable portion of the dam.

The flood peak at the dam from failure was computed to be 1270 cfs. Flow just prior to failure would be about 100 cfs. Based upon field observation of approximate full spillway discharge, the water surface elevation just below the dam prior to failure would be about 238 ft. Subsequent to failure, the water surface elevation below the dam would be about 241 ft. It would take the reservoir approximately 4 days to empty. About 700 feet downstream of Sleeper Dam, the peak flow from failure would flood portions of the Webster Rubber Co. factory to a depth of about 1 foot. About 0.7 of a mile downstream of Sleeper Dam, an abandoned factory and dam site would be flooded to depths of 1 or 2 feet. There would not likely be any structural damage downstream of the 0.7 mile reach below Sleeper Dam. In the 0.7 mile long reach below Sabattus Pond, the failure would probably result in damage to about 4 residences and a factory building. Danger of the loss of life may be considered to be minimal.

SECTION 6
STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observations. Based on the visual observations, the Sleeper Dam appears to be in fair condition. The stone masonry which forms the downstream face of the dam and supports the spillway crest appears loose in many areas with several voids existing where some stones have been displaced. Further displacement of the masonry will leave the spillway crest unsupported and could potentially cause breaching of the dam. The concrete surfaces of the outlet structure are deeply spalled near the bottom, however, this presently does not appear to pose a threat to the stability of the structure.
- b. Design and Construction Data. No data concerning original design or construction of the Sleeper Dam was disclosed in this investigation.
- c. Operating Records. None available.
- d. Post-Construction Changes. Changes have been made to the inlet structure above the gateworks. In this area, steel angles, channels, and pipes have been installed, apparently to protect the timber gates and timber members around the gates from large pieces of floating debris. The channels were installed as stop log slots upstream of the gates. No other post-construction structural changes are known to have been made.
- e. Seismic Stability. The dam is located in Seismic Zone No. 2, and in accordance with recommended Phase I guidelines, does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

- a. Condition. Based on the visual inspection, and performance history of the Sleeper Dam, it is assessed to be in fair condition. The test flood is the 1/2 PMF with the routed peak outflow estimated to be 3,300 cfs. The spillway capacity of the dam is about 90 cfs or 3% of the routed test flood. The left abutment is overtopped frequently. However, the overflow area is mostly exposed bedrock and is not very susceptible to erosion. The inspection of the facility resulted in the following major concerns:
- (1) The stone masonry which supports the spillway crest is loose and some stones have been displaced.
 - (2) The control outlet gate lifting stems are broken and are therefore inoperable.
 - (3) The concrete sidewalls and center pier in the outlet works are badly spalled.
 - (4) There is not adequate access to the control outlet gateworks during high flow.
- b. Adequacy of Information. The information available is such that the assessment of the condition of the dam must be based primarily on the visual inspection, the past operational performance of the dam, and engineering judgment.
- c. Urgency. The recommendations and remedial measures outlined in 7.2 and 7.3 below should be implemented within 12 months after receipt of this report by the owner.
- d. Need for Additional Investigation. Additional investigation is not considered necessary for the current assessment.

7.2 RECOMMENDATIONS

The following should be evaluated by a Registered Professional Engineer and implemented as found necessary:

- (1) The hydrology of the watershed and hydraulics of the dam with respect to the need for additional spillway and outlet capacity.
- (2) A provision for re-establishing the integrity of the stone masonry which forms the downstream face of the dam and supports the spillway crest. This evaluation must also consider a provision to maintain free drainage of the masonry portion of the dam structure.
- (3) The need and appropriate construction details for a facility to provide access to the control outlet gate-works during high flow.

7.3 Operating and Maintenance Procedures. A program of inspection and maintenance of the dam should be implemented and a record of these activities should be kept. The following specific maintenance and operating procedures should be implemented:

- (1) Repair of spalled concrete surfaces.
- (2) Repair of the outlet gates and operating equipment to return these gates to operable condition.
- (3) Clearing of trees and brush from the left abutment to provide better flow characteristics and to lessen deterioration of the bedrock surface and mortar-laid masonry fill.
- (4) Provide around-the-clock surveillance during periods of anticipated high runoff.
- (5) Develop a formal warning system and implement its use in the event of an emergency.
- (6) Have inspections of the dam made by Registered Professional Engineers once every year.

7.4 ALTERNATIVES

This investigation has identified no practical alternatives to the above recommendations.

APPENDIX A

VISUAL INSPECTION CHECKLIST

AND

SUPPLEMENTARY INSPECTION NOTES

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Sleeper Dam

DATE March 27, 1979

TIME A.M.

WEATHER Sunny, cold

W.S. ELEV. 244.15 U.S. D

PARTY:

- | | |
|--------------------------------|--------------------------------|
| 1. <u>Stephen W. Cole</u> | 6. <u> </u> |
| 2. <u>Brian Bisson</u> | 7. <u> </u> |
| 3. <u>Scott Decker</u> | 8. <u> </u> |
| 4. <u>John Kimble</u> | 9. <u> </u> |
| 5. <u> </u> | 10. <u> </u> |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Geotechnical</u>	<u>Cole</u>	
2. <u>Hydraulics/Hydrology</u>	<u>Bisson</u>	
3. <u>Civil</u>	<u>Decker</u>	
4. <u>Structural</u>	<u>Cole, Decker</u>	
5. <u>Survey</u>	<u>Kimble</u>	
6. <u>Photography</u>	<u>Bisson, Decker</u>	
7. <u> </u>		
<u>Review Inspection</u>	<u>March 17, 1979</u>	<u>C. Horstmann</u>
<u>Conditions basically same as above</u>		
<u> </u>		
<u> </u>		

NOTE: See Supplementary Inspection Notes Following Checklist

INSPECTION CHECKLIST

PROJECT Sleeper Dam DATE 3/27/79
 PROJECT FEATURE Embankment NAME Cole
 DISCIPLINE Geotechnical NAME _____

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	NOTE: Embankment consists only of back-fill at west abutment.
Crest Elevation	245+
Current Pool Elevation	244.15
Maximum Impoundment to Date	247+
Surface Cracks	None
Pavement Condition	Turf okay
Movement or Settlement of Crest	None
Lateral Movement	None
Vertical Alignment	Okay
Horizontal Alignment	Okay
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	None
Sloughing or Erosion of Slopes or Abutments	None
Vegetation	Turf and small brush

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u> (cont.)	
Rock Slope Protection - Riprap Failures	None
Unusual Embankment or Downstream Seepage	None
Piping or Boils	None
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

INSPECTION CHECKLIST

PROJECT Sleeper Dam DATE 3/27/79

PROJECT FEATURE Intake Channel/Structure NAME Cole, Decker

DISCIPLINE Structural, Hydraulics/
Hydrology NAME Bisson

AREA EVALUATED	CONDITION
----------------	-----------

OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE

a. Approach Channel	Cove of pond
Slope Conditions	Flat, good
Bottom Conditions	Gravel, clear
Rock Slides or Falls	None
Log Boom	None
Debris	Some floating debris
Condition of Concrete Lining	None
Drains or Weep Holes	None
b. Intake Structure	
Condition of Concrete	Fair, some erosion and spall
Stop Logs and Slots	No stop logs, stop log slots fair

INSPECTION CHECKLIST

PROJECT Sleeper Dam DATE 3/27/79
 PROJECT FEATURE Control Tower NAME Cole, Decker
 DISCIPLINE Structural NAME _____

AREA EVALUATED	CONDITION
----------------	-----------

OUTLET WORKS - CONTROL TOWER

a. Concrete and Structural

General Condition	Fair
Condition of Joints	Fair, some wear
Spalling	Minor spalling
Visible Reinforcing	None
Rusting or Staining of Concrete	None
Any Seepage or Efflorescence	None
Joint Alignment	Okay
Unusual Seepage or Leaks in Gate Chamber	None
Cracks	Crack in east side
Rusting or Corrosion of Steel	None

b. Mechanical and Electrical

Air Vents	N/A
Float Wells	N/A
Gate Hoist	New steel hoist beam above gate
Elevator	None

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - CONTROL TOWER (cont.)</u>	
Hydraulic System	None
Service Gates Emergency Gates	Timber vertical lift gates, lifting stems broken (gates in- operable).
Lightning Protection System	N/A
Emergency Power System	N/A
Wiring and Lighting System	N/A

INSPECTION CHECKLIST

PROJECT Sleeper Dam DATE 3/27/79
 PROJECT FEATURE Transition & Conduit NAME Cole, Decker
 DISCIPLINE Structural, Hydraulics/ NAME Bisson
Hydrology

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u>	
General Condition of Concrete	Fair
Rust or Staining on Concrete	None
Spalling	Severe spalling, bottom of side walls and pier
Erosion or Cavitation	Erosion of spalled areas
Cracking	None
Alignment of Monoliths	N/A
Alignment of Joints	Okay
Numbering of Monoliths	N/A

PERIODIC INSPECTION CHECKLIST

PROJECT Sleeper Dam DATE 3/27/79
 PROJECT FEATURE Outlet Structure/Channel NAME Cole, Decker
 DISCIPLINE Structural, Geotechnical NAME Bisson
Hydraulics/Hydrology

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND</u> <u>OUTLET CHANNEL</u>	
General Condition of Concrete	Fair
Rust or Staining	None
Spalling	Spall near bottom of walls and piers
Erosion or Cavitation	Erosion of spalled areas
Visible Reinforcing	None
Any Seepage or Efflorescence	Some leakage through east sidewall
Condition at Joints	Fair
Drain holes	None
Channel	
Loose Rock or Trees Overhanging Channel	None
Condition of Discharge Channel	Unobstructed

INSPECTION CHECKLIST

PROJECT Sleeper Dam DATE 3/27/79
 PROJECT FEATURE Spillway NAME Cole, Decker
 DISCIPLINE Geotech., Hydraulics/Hydrology NAME Bisson

AREA EVALUATED	CONDITION
----------------	-----------

OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS

a. Approach Channel

General Condition	Clear, good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Gravel, clear

b. Weir and Training Walls

General Condition of Concrete	Fair, cavities in D.S. stone masonry
Rust or Staining	None
Spalling	Minor spalling
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None
Drain Holes	None

c. Discharge Channel

General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Channel	Cobbles and gravel, clear
Other Obstructions	None

INSPECTION CHECKLIST

PROJECT Sleeper Dam DATE 3/27/79
 PROJECT FEATURE Service Bridge NAME Decker
 DISCIPLINE Civil NAME _____

AREA EVALUATED	CONDITION
----------------	-----------

OUTLET WORKS - SERVICE BRIDGE

a. Superstructure

Bearings

Anchor Bolts

Bridge Seat

Longitudinal Members

NOT APPLICABLE

Under Side of Deck

No
Service
Bridge

Secondary Bracing

Deck

Drainage System

Railings

Expansion Joints

Paint

b. Abutment & Piers

General Condition of Concrete

Alignment of Abutment

Approach to Bridge

Condition of Seat & Backwall

SUPPLEMENTARY INSPECTION NOTES

SLEEPER DAM SABATTUS, MAINE

APPENDIX A

I. CONCRETE AND STONE MASONRY STRUCTURES IN GENERAL

- a. Concrete Surfaces. In general the concrete surfaces of the Sleeper Dam are in fair condition. Some spalling is evident on the controlled outlet and crest of the spillway. Fairly severe spalling has occurred near the lower portions of the sidewalls and central pier in the controlled outlet section.

Stone Masonry Surfaces - The downstream face of the spillway section of the dam is constructed of dry-laid stone masonry. Loss of masonry has created voids in the downstream face, some are quite large. A detailed inspection of the masonry could not be made due to the water flowing over the spillway section. However, photographs taken previously during a dry period indicate a loss of masonry from the downstream face (see Photos #7 and 11).

- b. Structural Cracking. No structural cracks were observed in the crest of the spillway or abutment sections of the dam. However, photos taken previously show what appears to be either a structural crack or open joint in the right spillway crest. One structural crack exists in the left side of the outlet section of the dam. This crack appears to extend only through the sidewall of the outlet structure.
- c. Movement, Horizontal and Vertical Alignment. The entire dam section appears to be true to line and grade. No evidence of either horizontal or vertical movement was observed.
- d. Junctions. The junctions in the structure between the spillways and the abutments and the spillways and the controlled outlet section appear to be in good condition and no evidence of movement or excessive leakage or seepage was noted. Some minor leakage is occurring at the junction between the spillway and the west abutment.

- e. Drains. No formal drains were observed in the dam. The dam is constructed of dry-laid stone masonry which has inherent drainage characteristics.
- f. Water Passages. The surface of the spillway section appears to be in generally good condition with no evidence of serious erosion or scour. The interior surface of the controlled outlet sluiceways appears to be in fair condition. Substantial spalling and erosion has occurred on the lower portion of the side walls and the central pier.
- g. Seepage or Leakage. At the time of inspection a substantial flow of water was occurring over the spillway and through the controlled outlet section. No evidence of seepage or leakage could be observed in any portion of the dam.
- h. Monolith Joints, Construction Joints. All joints in the dam appear to be in fair condition with no evidence of movement or extreme wear or erosion noted in any of the joints.
- i. Foundation. The easterly portion of the dam appears to be founded directly on bedrock. The westerly end of the dam appears to be founded on soil. No evidence of undermining could be observed at the time of inspection. Due to the fairly true alignment of the structure it appears that no foundation distress has occurred. Based on photos taken in the fall of 1978, it appears that no substantial downstream scour or undermining of the structure has occurred.
- j. Abutments. The abutments of the dam were found to be in good condition with no evidence of seepage or leakage, and no evidence of settlement or instability.

2. EMBANKMENT STRUCTURES

The embankment of the dam consists of only backfill at the westerly abutment of the structure.

- a. Settlement. No evidence of settlement in the embankment section of the dam was observed.
- b. Slope Stability. The slope of the embankment west of the dam (approximately 3:1) shows no evidence of slope instability.

- c. Seepage. No evidence of seepage through the embankment or through the abutment at the right end of the dam was observed.
- d. Drainage. No drainage system is known to exist and none was observed at the structure.
- e. Slope Protection. The embankment section is turf covered and no evidence of erosion was noted during the inspection.

3. SPILLWAY STRUCTURES

The spillway at Sleeper Dam consists of two sections of concrete free overfall spillway and a section of mortar-laid stone masonry spillway. The concrete crest section left of the gated outlet is 22 feet long and somewhat lower than the right section which is 45.5 feet long. The left section is also provided with flashboard rods. At the left end of the dam there is a section of bedrock approximately 150 feet long, which has some stone masonry placed on top of the bedrock outcrop. This area forms a 58 foot long spillway for the structure (see Photo #3). No evidence of serious erosion or scour was observed. Flow was occurring over this section at the time of inspection (3/17/79).

- a. Control Gates and Operating Machinery. The spillway at the dam is uncontrolled.
- b. Unlined Saddle Spillways. None.
- c. Approach and Outlet Channels. The upstream channel is formed by Sabattus Pond, the spillway approaches are clear and unobstructed. The channel immediately downstream of the dam is formed primarily by ledge and cobbles. There are some boulders about 2 feet in diameter downstream of the dam, primarily on the left side. The banks of the river have a moderate growth of trees and brush (see Photos #1 and 2).
- d. Stilling Basin. The stilling basin consists of the stream channel below the dam. No erosion or scour was in evidence.

4. OUTLET WORKS

The outlet works at Sleeper Dam consists of two timber vertical lift gates.

- a. Intake Structure. The intake structure consists of concrete headwalls and a provision for stop logs upstream of the gate. A substantial amount of floating debris was present immediately upstream of the inlet structure.
- b. Operating and Control Gates. The gates consist of two vertical lift timber gates. The lifting stems on the gates have been broken and the gates are presently inoperable (see Photo #4). The hoisting equipment with the exception of the lifting stems appears to be in fair to good condition.
- c. Conduits, Sluices and Water Passages. The interior surfaces of the sluiceway appear to be in generally good condition. Substantial spalling and erosion has occurred on the lower portion of the sidewalls and the central pier (see Photos #6, 7 and 8). No serious leakage is occurring into the outlet conduit.
- d. Stilling Basin. The stilling basin below the outlet consists of the stream channel. No evidence of serious erosion or scour was noted.
- e. Approach and Outlet Channel. The approach and outlet channels to the outlet works are clear and unobstructed.
- f. Drawdown Facilities. The two vertical lift gates provide drawdown facilities.

5. SAFETY PERFORMANCE INSTRUMENTATION

None.

6. DOWNSTREAM CHANNEL

The channel immediately downstream of the dam is comprised primarily of ledge and cobbles. There are some boulders about 2 feet in diameter downstream of the dam, primarily on the left side.

8. OPERATION AND MAINTENANCE FEATURES

- a. Reservoir Regulation Plan. None.
- b. Maintenance. It appears that maintenance has been performed on the Sleeper Dam on an as-needed basis. Presently, maintenance is necessary on the controlled outlet works including the gates and the outlet sluiceway;

and on the masonry portions of the dam, where large cavities exist.

APPENDIX B
ENGINEERING DATA

This appendix lists the engineering data collected either from project records or other sources of data developed as a result of the visual inspection. The contents of this appendix are listed below.

<u>Appendix</u>	<u>Description</u>
B-1	General Project Data

B-1
Sleeper Dam

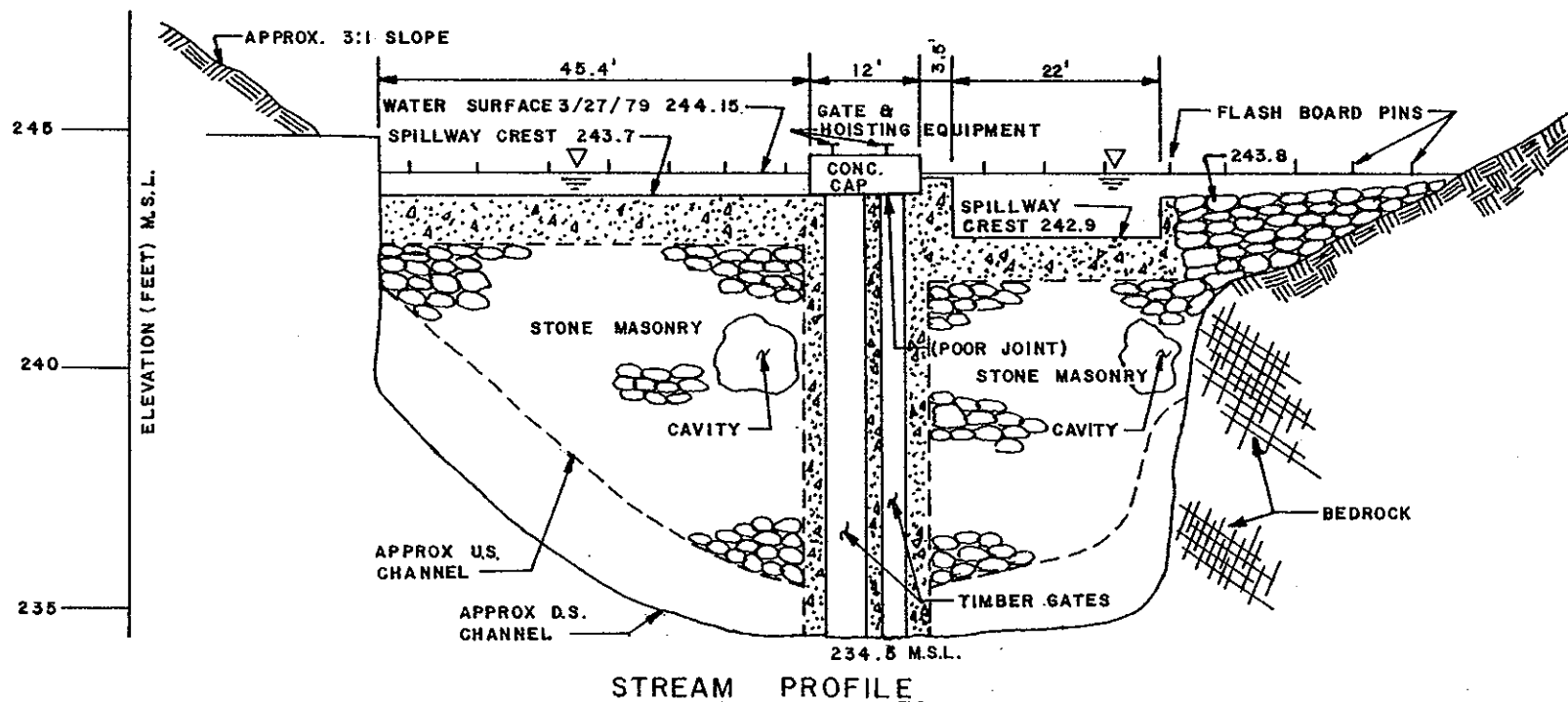
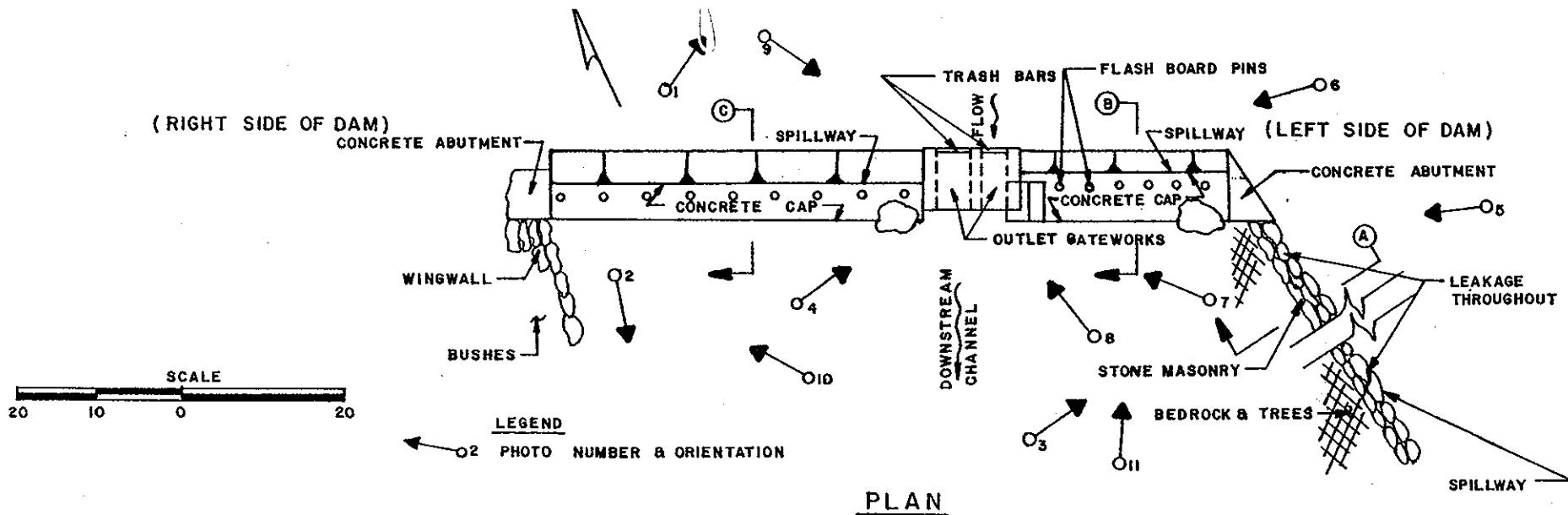
APPENDIX B-1

GENERAL PROJECT DATA

The following plan, profile and cross-sections of Sleeper Dam were developed from a limited stadia survey performed during visual inspection, field notes taken by inspection team members, and photographs taken during the visual inspection. The survey was referenced to an arbitrary local datum. Approximate U.S.G.S. elevations were estimated by noting the dam's location on the U.S. Geologic Survey map and assuming that the easterly spillway crest is equal to normal water surface of Sabattus Pond of approximate elevation 243 (MSL).

B-1.1

Sleeper Dam



EDWARD C. JOHAN CO., INC.
PORTLAND, MAINE
REGISTERED PROFESSIONAL ENGINEERS
MAINE, MASS.

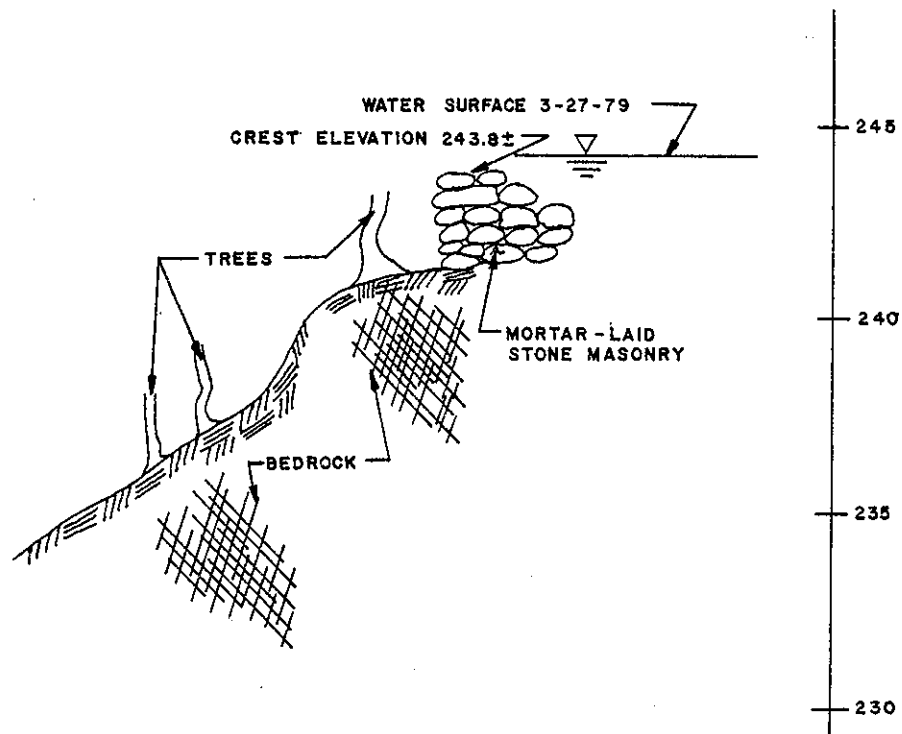
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

SLEEPER DAM
PLAN & PROFILE

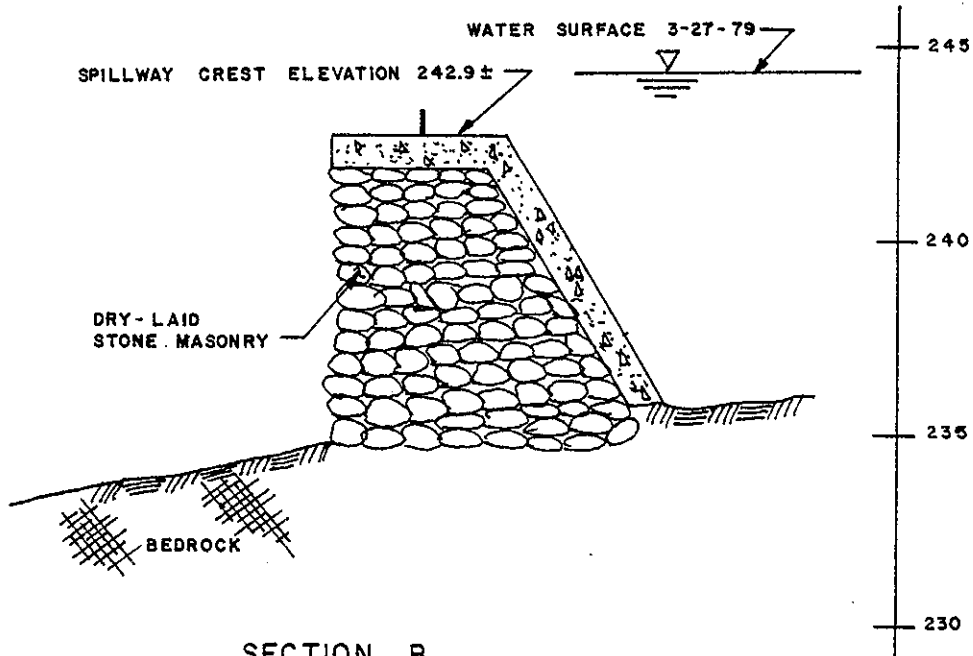
SABATTUS POND OUTLET SABATTUS ME.

DATE MAY 1979

20799 20

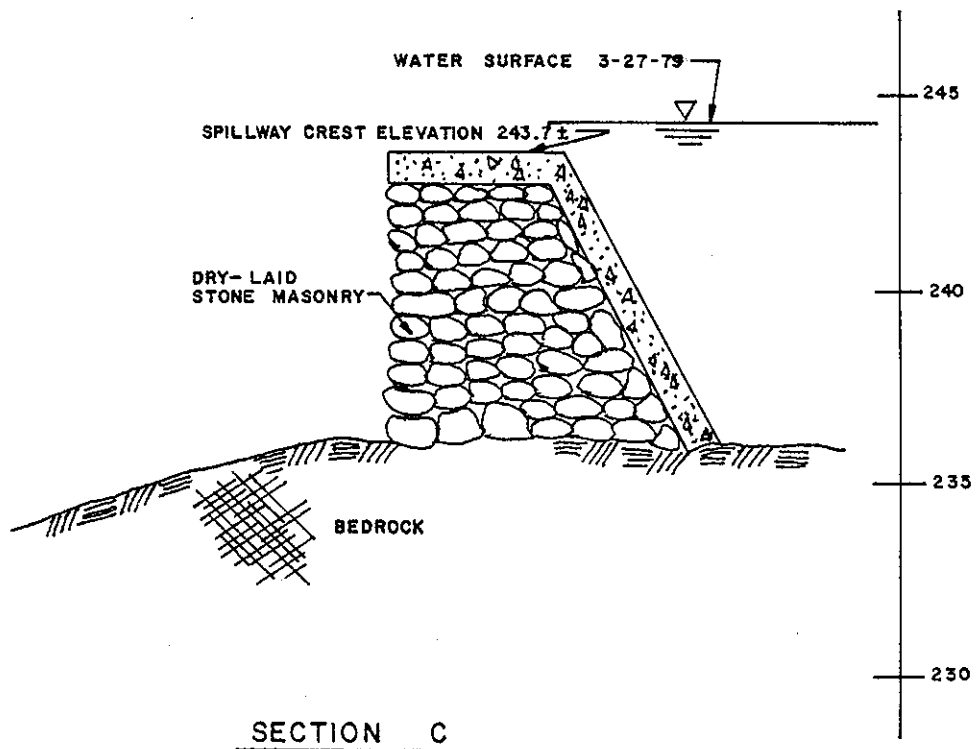


SECTION A



SECTION B

EDWARD C. JORDAN CO., INC. PORTLAND, MAINE	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WILTHAM, MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS	
SLEEPER DAM CROSS SECTIONS	
SABATTUS POND OUTLET, SABATTUS ME.	
20799/20	SCALE AS SHOWN DATE MAY 1979

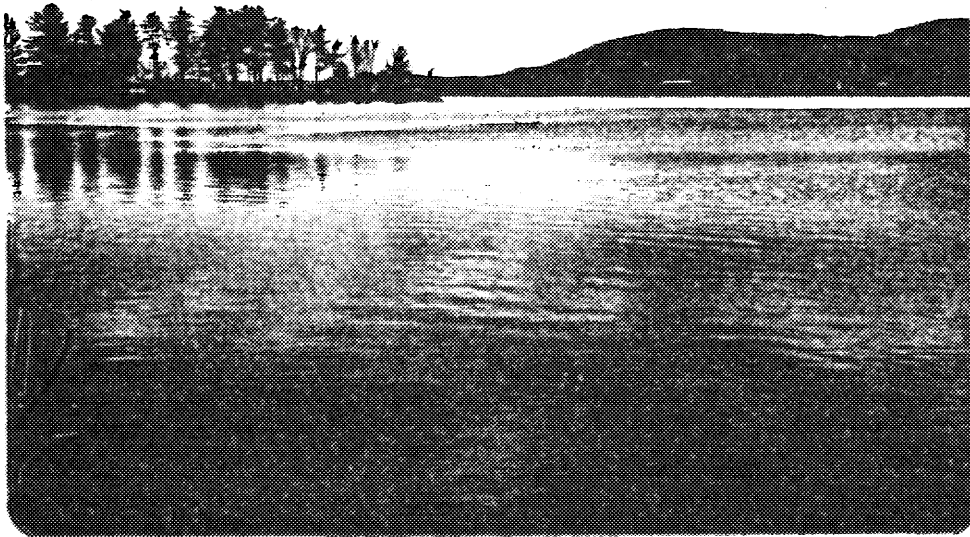


EDWARD C. JORDAN CO., INC. PORTLAND, MAINE	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	
SLEEPER DAM CROSS SECTIONS	
SABATTUS POND OUTLET	SABATTUS ME.
20799120	SCALE AS SHOWN DATE MAY 1979

APPENDIX C

PHOTOGRAPHS

The following are photographs referenced in this report. See Sheet B-1 for photograph locations and orientations. Photographs 1-5 were taken by the inspection team on March 27, 1979. The remaining photos were taken, in the fall of 1978, by an owner of property adjacent to the dam.



1

VIEW UPSTREAM

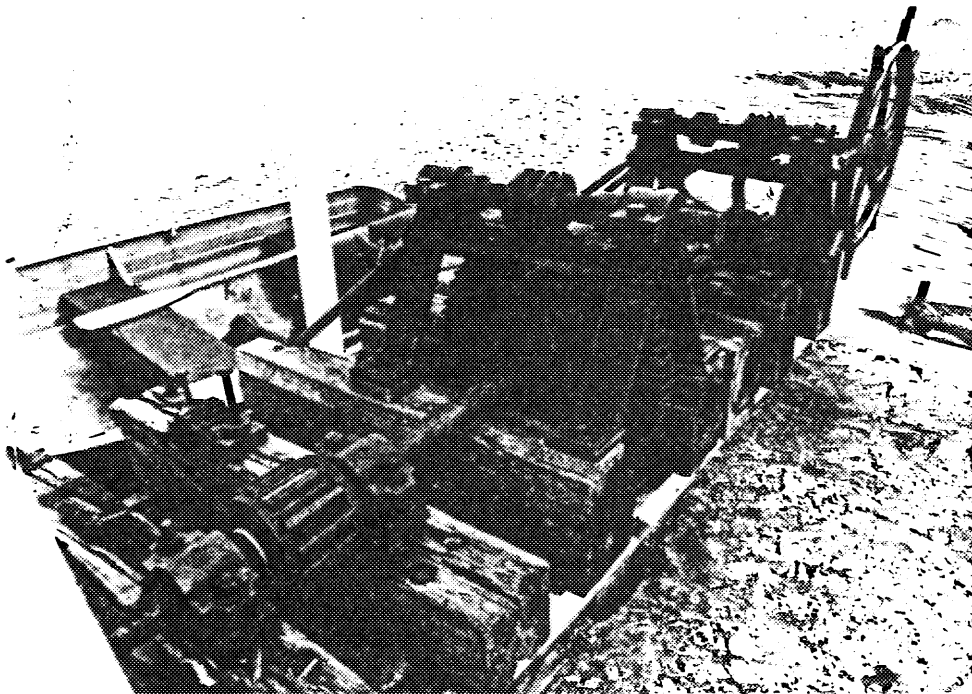


VIEW DOWNSTREAM



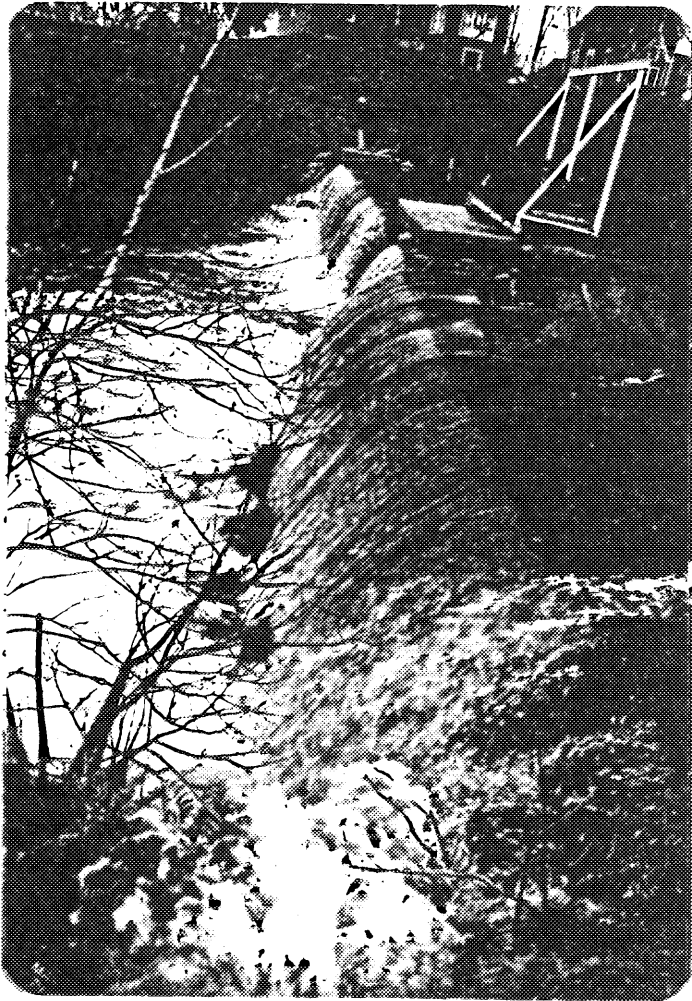
3

SPILLWAY - LEFT ABUTMENT



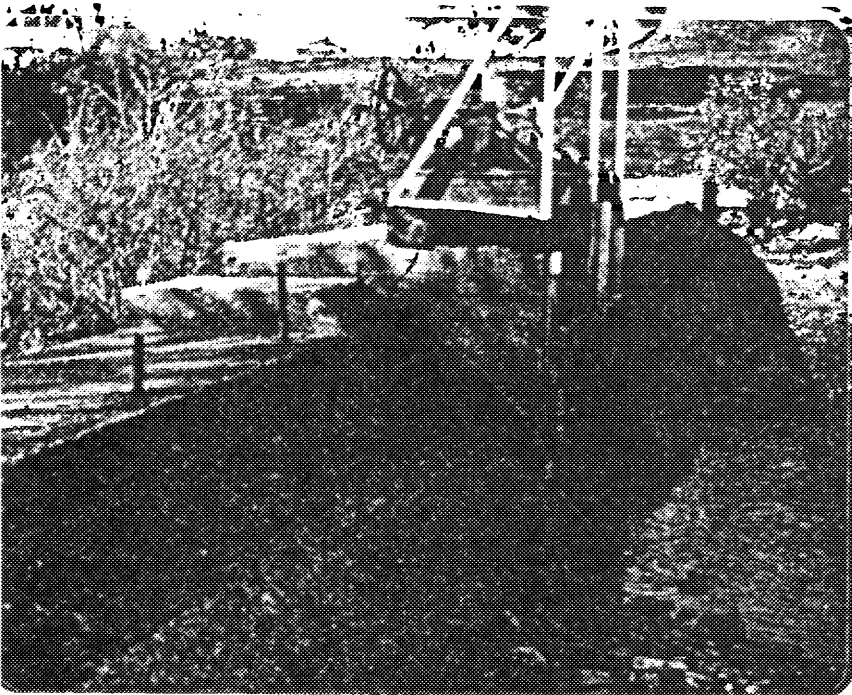
4

GATE OPERATING EQUIPMENT



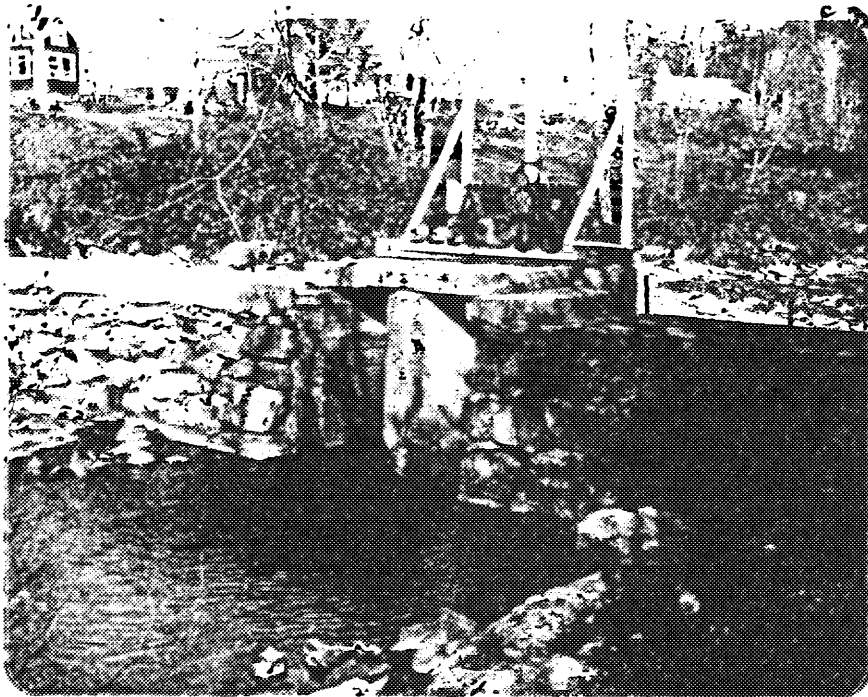
5

SPILLWAY CREST



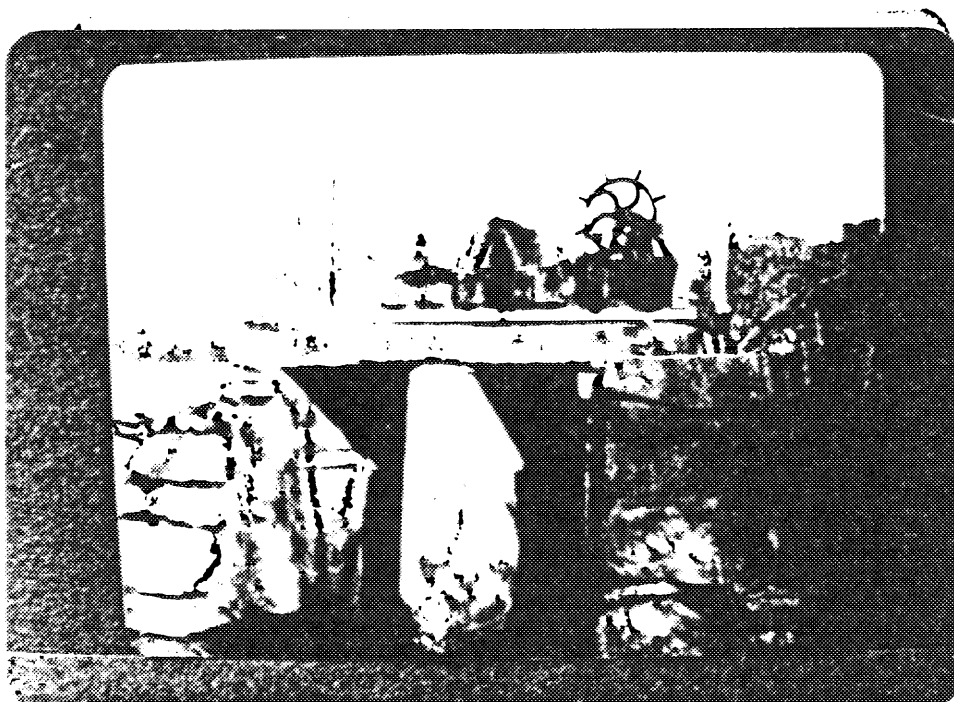
6

UPSTREAM FACE
FROM EAST ABUTMENT



7

DOWNSTREAM FACE

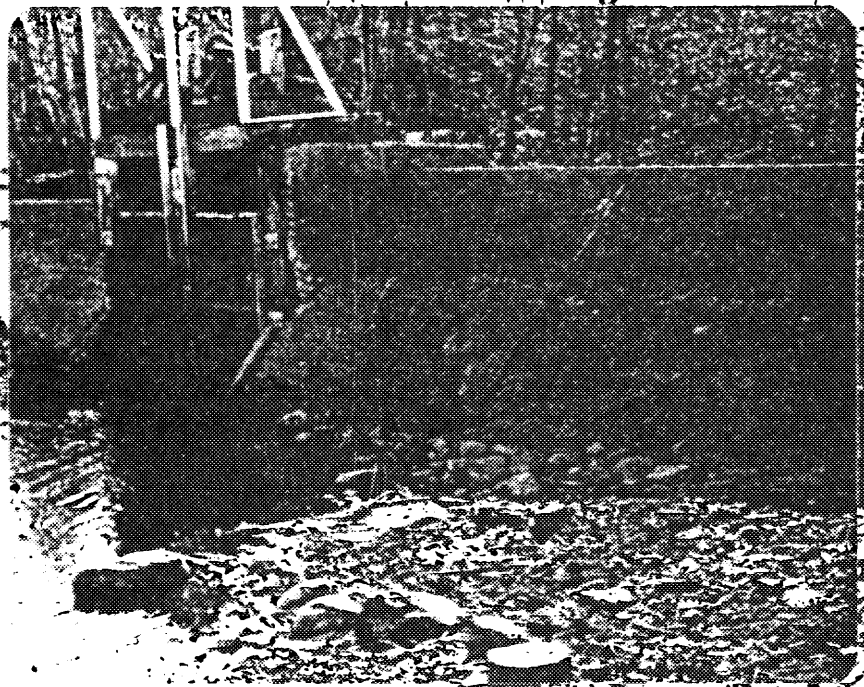


8

GATED OUTLET SLUICE

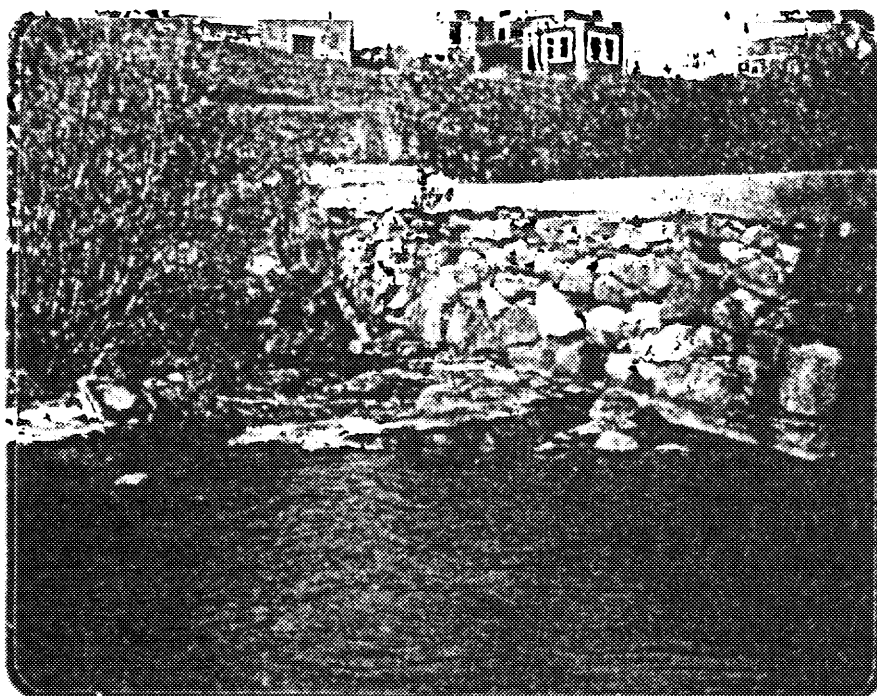
C-5

SLEEPER DAM



9

UPSTREAM FACE
FROM WEST EMBANKMENT



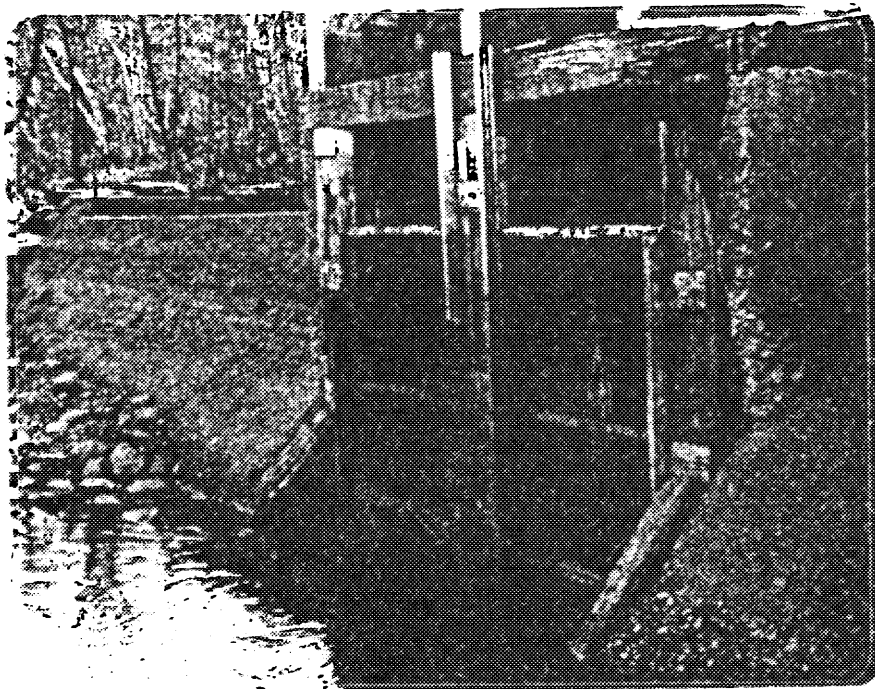
10

DOWNSTREAM FACE OF WESTERLY SPILLWAY
NOTE BRUSH IN DOWNSTREAM CHANNEL



11

DOWNSTREAM FACE - LEFT SPILLWAY
NOTE ERODED AREA



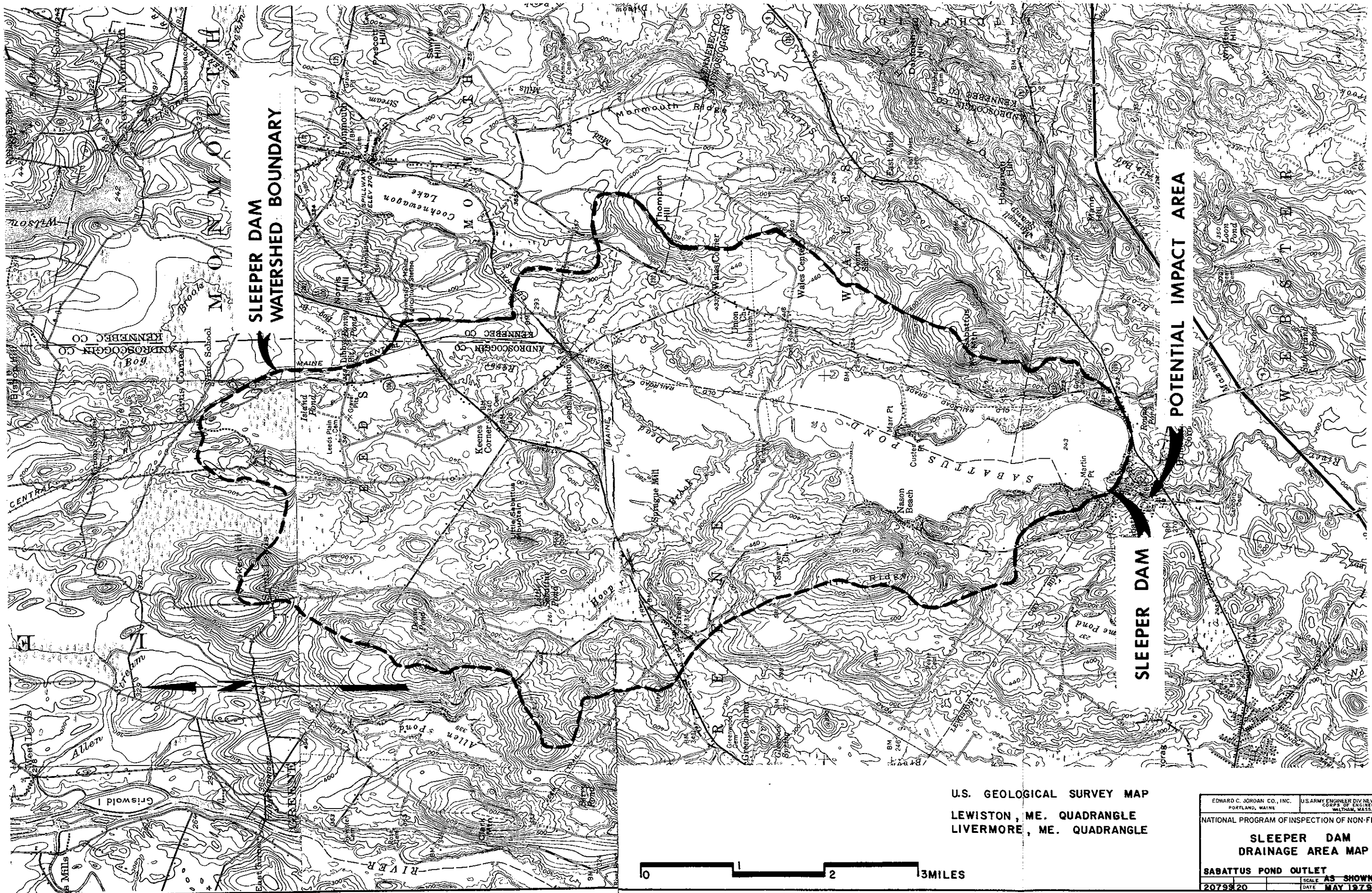
12

GATED OUTLET - VIEW FROM UPSTREAM
NOTE DETERIORATION OF CONCRETE

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

Hydrologic computations pertinent to this investigation are attached. The following drainage area map shows the watershed at Sleeper Dam.



U.S. GEOLOGICAL SURVEY MAP
LEWISTON, ME. QUADRANGLE
LIVERMORE, ME. QUADRANGLE

0 1 2 3 MILES

EDWARD C. JORDAN CO., INC. PORTLAND, MAINE	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	
SLEEPER DAM DRAINAGE AREA MAP	
SABATTUS POND OUTLET	
2079920	SCALE AS SHOWN DATE MAY 1979

PROJECT	SLEEPER DAM AREAS	COMP BY	JOB NO.
		BTB	2079920
		CHK BY	DATE
		JTD	3-30-79

SLEEPER DAM D.A. 33.75⁹ Mi
21,568 Acres

SABATTUS POND SURFACE AREA (EL 243) . . . 2048 Ac

SABATTUS POND SURFACE AREA (EL 260) . . . 3072 Ac

FROM COE INVENTORY:

NORMAL IMPOUNDING CAPACITY 3600 Ac-Ft

MAXIMUM IMPOUNDING CAPACITY 4200 Ac-Ft

PROJECT SPILLWAY HYDRAULICS	COMP BY BTB	JOB NO. 20799
	CHK BY JTD	DATE 3-30-

SURVEY DATUM ELEV	MSL DATUM ELEV.	C VALUE	CREST@242.9 L=22.0'		CREST@243.7 L=45.4'		TOTAL SPILLW. FLOW CFS
			EASTERLY SPILLWAY DISCHARGE CFS	C VALUE	WESTERLY SPILLWAY DISCHARGE CFS		
97							
98	243	2.34	2				
99	244	2.67	68	2.42	18		
100	245	2.65	177	2.65	178	3.	
	246	2.66	319	2.66	421	7	
102	247	2.70	493	2.67	727	12	
	248	2.79	707	2.72	1101	18	
104	249	2.88	955	2.83	1568	25	
	250		1199	2.88	2068	32	
106	251		1461		2579	40	
	252		1739		3127	48	
108	253		2034		3708	57	
	254		2343		4322	66	
110	255		2667		4967	76	

PROJECT DAM HYDRAULICS	COMP BY BTB	JOB NO. 20799 20
	CHK BY JJD	DATE 3-30-79

MSL DATUM ELEV	¹ C VALUE	CREST @ 244 L = 61.5' EASTERLY ABUTMENT CFS	¹ C VALUE	CREST @ 245 L = 6.5' WESTERLY ABUTMENT CFS	* C VALUE	CREST @ 244.5 L = 12' TOP OF GATE STRUCTURE CFS
244						
245	2.68	165			2.5	
246	2.65	461	2.68	17		11
247	2.66	850	2.65	49		55
248	2.70	1328	2.66	90		119
249	2.79	1918	2.70	140		196
250	2.88	2603	2.79	203		286
251	↓	3280	2.88	275		387
252		4008	↓	347		497
253		4782		424		616
254	↓	5601	↓	505		743
255		6462		592	↓	878

¹ FROM BRATER & KING, HANDBOOK OF HYDRAULICS, 6TH EDITION

* LOW VALUE BECAUSE OF CONTROL OUTLET WORKS.

GATES INOPERABLE : MAX CAPACITY IF OPERABLE -

* $Q = C A \sqrt{2gh}$

$$Q = 0.7(3.3 \times 9.5 + 4.2 \times 9.5) \sqrt{2 \times 32.2(1)} \approx 400 \text{ CFS}$$

* ORIFICE FLOW EQUATION FROM BRATER & KING,
HANDBOOK OF HYDRAULICS, 6TH EDITION.

PROJECT

STORAGE - DISCHARGE
TABLE

COMP. BY

BTB

JOB NO.

20799

CHK. BY

JJD

DATE

4-5-7

MSL DATUM ELEV	AREA ACRES	ABOVE CREST STORAGE ¹ ACRE-Feet	DISCHARGE CFS
242	—	—	—
243	2048	—	2
244	2108	2048	86
245	2168	4186	520
246	2229	6384	1229
247	2289	8643	2174
248	2349	10962	3345
249	2409	13341	4777
250	2470	15780	6359
251	2530	18280	7982
252	2590	20840	9718
253	2650	23460	11564
254	2711	26141	13514
255	2771	28882	15566
260	3072		

EASTERLY CREST ELEV = 242.9

WESTERLY CREST ELEV = 243.7

EASTERLY ABUTMENT = 244.0

WESTERLY ABUTMENT = 245.0

¹ ASSUME NORMAL POND OR BELOW CREST STORAGE
IS EQUAL TO 3600 AC-FT AS PER CORPS
INVENTORY.

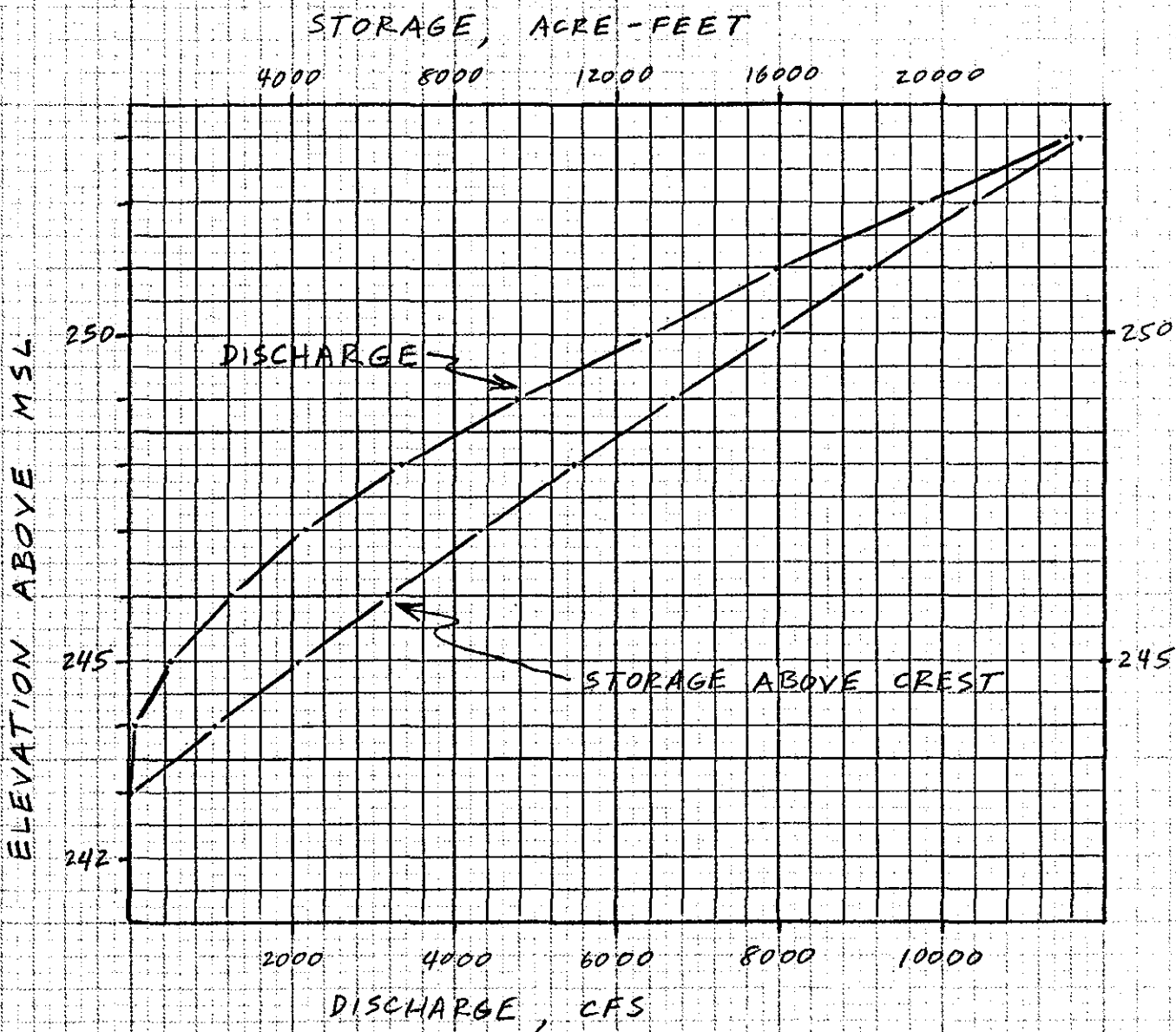
D- 6

Sleeper Dam

PROJECT SLEEPER DAM
STORAGE - DISCHARGE CURVE

COMP. BY
BTB
CHK. BY
SJD

JOB NO.
20799 20
DATE
4-5-79



D-7
Sleeper Dam

PROJECT

TEST FLOOD

COMP. BY

BTB

JOB NO.

20799

CHK. BY

WJD

DATE

4-5-

DRAINAGE AREA = 33.7 sq mi

SIZE CLASSIFICATION = INTERMEDIATE

(MAX STORAGE 4200 AC-F)

HAZARD CLASSIFICATION = SIGNIFICANT

SLOPE = FLAT

TEST FLOOD = $\frac{1}{2}$ PMF

FROM COE "PRELIMINARY GUIDANCE FOR
ESTIMATING MAX PROB DISCHARGES

PMF = 550 CFS/SQ MI

$\therefore \frac{1}{2}$ PMF = 275 CFS/SQ MI

OR $\frac{1}{2}$ PMF = $33.7 (275) \approx \underline{\underline{9,300 \text{ CFS}}}$

D-8

Sleeper Dam

PROJECT

EFFECT OF SURCHARGE
STORAGE ON TEST FLOOD

COMP. BY

BTB

CHK. BY

JTD

JOB NO.

20799 20

DATE

4-5-79

 V_2 PMF INFLOW = 9,300 CFS1.) SURCHARGE HEIGHT TO PASS V_2 PMF = 8.9'
@ 251.75VOLUME OF SURCHARGE (STOR₁) = 20,200 Ac-Ft

$$\text{OR } \text{STOR}_1 = \frac{20,200}{21,568} \times 12 = 11.2''$$

$$Q_{P2} = Q_{P1} \left(1 - \frac{\text{STOR}_1}{9.5}\right) = 9300 \left(1 - \frac{11.2}{9.5}\right) = 0$$

2.) SURCHARGE HEIGHT TO PASS $Q_{P2} = 0$ Ft.
@ EL 242.9

$$\text{STOR}_2 = 0$$

$$\text{STOR}_{\text{AVE}} = \frac{\text{STOR}_1 + \text{STOR}_2}{2} = 5.6''$$

$$Q_{P3} = 9,300 \left(1 - \frac{5.6}{9.5}\right) = 3818 \text{ CFS}$$

3.) SURCHARGE HEIGHT TO PASS $Q_{P3} = 5.4'$
@ EL 248.3

$$\text{STOR}_3 = 11,700 \text{ Ac-Ft}$$

$$\text{OR } \text{STOR}_3 = \frac{11,700}{21,568} \times 12 = 6.5''$$

$$\text{STOR}_{\text{AVE}} = \frac{6.5 + 5.6}{2} = 6.05$$

$$Q_{P4} = 9300 \left(1 - \frac{6.05}{9.5}\right) = 3377$$

D-2

Sleeper Dam

PROJECT

EFFECT OF SURCHARGE
STORAGE ON TEST FLOOD

COMP. BY

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JOB NO.

20799

DATE

4-5-7

4.) SURCHARGE HEIGHT TO PASS $Q_{P4} = 5.2'$

@ EL 248.1

$$STOR_4 = 11,000 A_c - F t$$

$$\text{OR } STOR_4 = \frac{11,000}{21568} \times 12 = 6.1$$

$$STOR_{AVE} = \frac{6.1 + 6.05}{2} = 6.1$$

$$Q_{P5} = 9300 \left(1 - \frac{6.1}{9.5} \right) \approx \underline{\underline{3,300 \text{ CFS}}}$$

@ EL = 248.0PEAK DISCHARGE OF $\frac{1}{2}$ PMF = 3,300 CFS

STAGE = 248.0

WESTERLY ABUTMENT OVERTOP = 3.0'

EASTERLY ABUTMENT OVERTOP = 4.0'

SPILLWAY CAPACITY = 2.6% OF $\frac{1}{2}$ PMF

D-10

Sleeper Dam

PROJECT

DAM FAILURE ANALYSIS

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CRITERIA : MOST LIKELY LOCATION FOR FAILURE
IS THE EASTERLY SPILLWAY

$$L = W_b = 22'$$

$$Y_o = 10.0 \text{ [@ EL 244.5]}$$

$$\text{FAILURE FLOW } Q_p = \frac{8}{27} W_b \sqrt{g} Y_o^{3/2}$$

$$Q_p = \frac{8}{27} (22) (\sqrt{g}) (10)^{3/2} = 1170 \text{ CFS}$$

WESTERLY SPILLWAY FLOW

$$\text{AT TIME OF FAILURE} = 98 \text{ CFS}$$

$$\text{TOTAL FAILURE FLOW} \approx \underline{\underline{1270 \text{ CFS}}}$$

TIME FOR RESERVOIR TO EMPTY, T :

$$T = \frac{12.1 S}{\frac{1}{2} Q_{p1}} = \frac{12.1 (4200)}{\frac{1}{2} (1270)} = 80 \text{ hrs}$$

$$\underline{\underline{T \approx 4 \text{ DAYS}}}$$

D-11

Sleeper Dam

PROJECT

DAM FAILURE HYDROGRAPHS

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AT SECTION 1, FIRST DOWNSTREAM BRIDGE :

STORAGE IS INSIGNIFICANT

FLOW = 1250 CFS

DEPTH AT BRIDGE OPENING $\approx 6.5'$

$$\left[\frac{1270}{6.5 \times 19.5} \right]^2 / 2g = 1.5'$$

 \therefore BRIDGE OPENING WOULD BE

APPROX FILLED: WEBBER RUBBER CO.

FLOODED TO DEPTHS OF 1' OR 2'

AT 2ND DOWNSTREAM DAM :

STORAGE IS INSIGNIFICANT

LOCATION IS 0.7 MI DOWNSTREAM

FLOW = 1270 CFS

HEAD ON SPILLWAY = 4.5'

FACTORY RUINS AT DAMSITE

FLOODED TO DEPTH OF
1 OR 2 FEET

FOR REACHES BELOW 2ND DOWNSTREAM
DAM, FAILURE FLOOD FLOWS WOULD
ESSENTIAL BE RETAINED WITHIN
RIVER BANKS.

D-12

Sleeper Dam

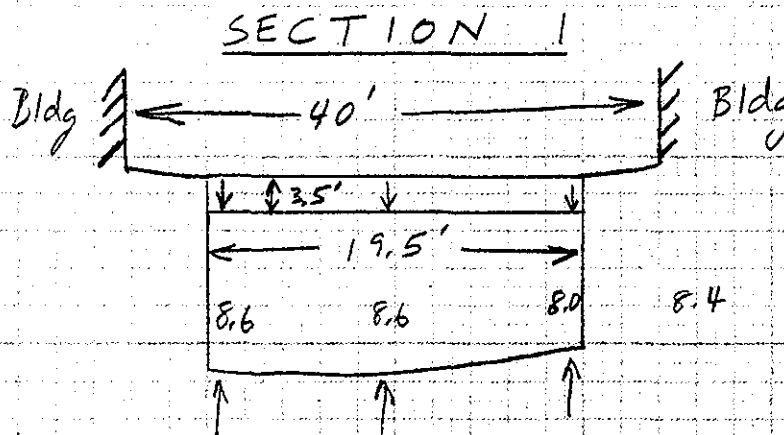
PROJECT
RATING CURVE AT FIRST
DOWNSTREAM BRIDGE

COMP. BY
BTB

CHK. BY
JDD

JOB NO.
20799 20

DATE
4-5-79



NOTE: SECTION 1
N700' DOWNSTREAM
OF DAM; STORAGE
INSIGNIFICANT

$$\text{Slope} = \frac{234.5 - 200}{3850} = 0.009$$

$$n = 0.035$$

DEPTH FT	AREA FT ²	$R^{2/3}$	$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$ DISCHARGE CFS
0			
1	19	0.921	70
2	39	1.402	220
3	58	1.730	404
4	78	2.004	630
5	99	2.242	894
6	117	2.399	1131
7	136	2.546	1395
8	156	2.684	1686
9*	164	—	713
10	↓	—	1164
11	↓	—	1484
12**	↓	—	1749
13	↓	—	2093
14	↓	—	2494

*PRESSURE FLOW ABOVE DEPTH 8.4', $Q = CA\sqrt{2gh}$, $C=0.7$

**PRES. AND WEIR FLOW ABOVE DEPTH 11.9', $Q = CLH^{3/2}$, $C=2.6$

D-13

Sleeper Dam

PROJECT

RATING CURVE BELOW 2ND
DOWNSTREAM BRIDGE AT DAM

COMP. BY

BTB

JOB NO.

20799

CHK. BY

JJD

DATE

4-9-

2ND DOWNSTREAM DAM (0.7 MI DOWNST
(1ST DOWNSTREAM DAM BREACHED)

HEAD FT	C* FACTOR	L=40' Q=CL 1 1/2 DAM WEIR DISCHARGE CFS	L=25 WEST OVERBANK WEIR, C=26 DISCHARGE CFS	TOTAL DISCHARGE CFS	STOR. ACRE.
1	2.67	107		107	
2	2.68	303		303	
3	2.73	567		567	
4	2.79	893	65	958	
5	3.07	1373	184	1557	
6	3.32	1952	338	2290	
7		2459	1520	2979	
8		3005	727	3732	
9		3586	1955	4541	1
10		4200	1204	5404	1
11		4845	1471	6316	1
12		5520	1755	7275	1
13		6225	2055	8280	2
14		6956	2371	9327	2
15		7715	2702	10417	2

* TAKEN FROM BRATER & KING, HANDBOOK OF HYDRAULICS

D-14

Sleeper Dam

PROJECT

AVERAGE X-SECT ABOVE

2ND DOWNSTREAM DAM

COMP. BY

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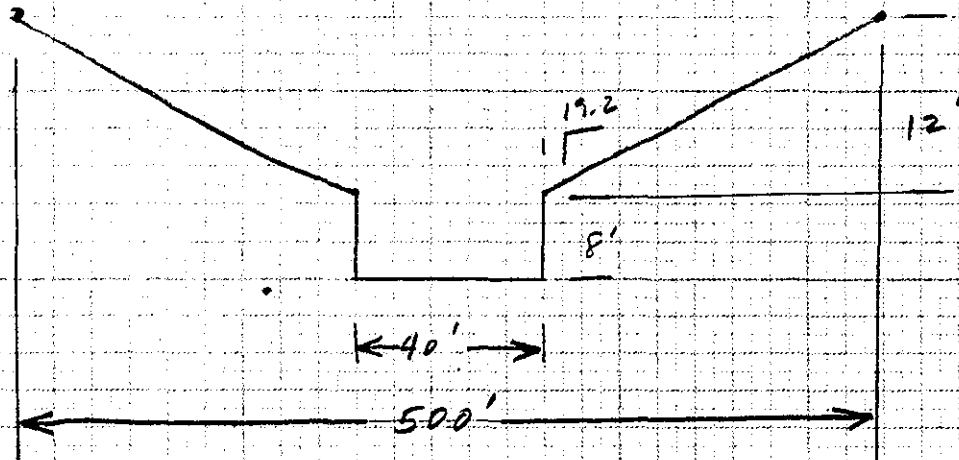
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4-9-79



AT CREST DAM ALREADY HAS 4'
DEPTH OF STORAGE. SLOPE UPSTREAM
OF DAM APPEARS TO BE STEEP ENOUGH
SO THAT THERE IS VERY LITTLE DEAD
WATER BEHIND DAM.

D-15

Sleeper Dam

PROJECT

DAM FAILURE HYDROGRAPHS
STORAGE ANALYSISCOMP BY
BTBCHK. BY
WDJOB NO.
207992DATE
7-2-79AT SECTION 1 - ROUTING ANALYSIS

$$Q_{p2}(\text{TRIAL}) = Q_{p1} \left(1 - \frac{V_1}{S}\right)$$

$$S = 4200 \text{ AC-FT}$$

$$V_1 = \frac{(10.0)(50')(700')}{43560} = 8.0 \text{ AC-FT @ CALL. ELEV.}$$

∴ STORAGE INSIGNIFICANT

$$Q_{p1} = 1250 \text{ cfs}$$

$$Q_{p2} = 1250 \left(1 - \frac{8.0}{4200}\right) = 1250 \text{ CFS}$$

AT SECTION 2 - ROUTING ANALYSIS

$$S = 4200 \text{ AC-FT}$$

$$V_1 = 25.5 \text{ AC-FT @ CALL. ELEV. ∴ STORAGE INSIGNIFICANT}$$

$$Q_{p1} = 1250 \text{ CFS}$$

$$Q_{p2} = 1250 \left(1 - \frac{25.5}{4200}\right) = 1250 \text{ CFS}$$

APPENDIX E

Information as Contained in the National
Inventory of Dams